SEQUENCE LISTING

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<120> SYNTHETIC HUMAN PAPILLOMAVIRUS GENES

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<141> 2003-12-04

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<151> 2000-06-07

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cgcctgctgg ccgtgggcca ccccctacttc cccatcaaga agcccaacaa caacaagatc 180
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gtggacaacc gcgagtgcat cagcatggac tacaagcaga cccagctgtg cctgatcggc 480
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ccctacggcg acagcctgtt cttctacctg cgccgcgagc agatgttcgt gcgccacctg 780
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aagaagcgca agctgtaa                                            1518
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<210> 2
<211> 1950
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<213> Artificial Sequence

<220>
<223> Mutant, Codon-Optimized HPV16 E1

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ttcgtgaaca gcaagagcca cttctggctg cagcccctgg ccgacgccaa gatcggcatg 1560
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aaccgcctgg tggtgttcac cttccccaac gagttcccct cgacgagaa cggtaacccc 1800
gtgtacgagc tgaacgacaa gaactggaag agcttcttca gccgcacctg gagccgcctg 1860
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agcctgcacg aggacgagga caaggagaac gacggcgaca gcctgcccac cttcaagtgc 1920
gtgagcggcc agaacaccaa caccctgtaa                                   1950


<210> 3
<211> 1098
<212> DNA
<213> Artificial Sequence


<220>
<223> Mutant, Codon-Optimized HPV16 E2


<400> 3
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aacgacagca ccgacctgcg cgaccacatc gactactgga agcacatgcg cctggcctgc 120
gccatctact acaaggcccg cgagatgggc ttcaagcaca tcaaccacca ggtggtgccc 180
accctggccg tgagcaagaa caaggccctg caggccgccg agctgcagct gaccctggag 240
accatctaca acagccagta cagcaacgag aagtggaccc tgcaggacgt gagcctggag 300
gtgtacctga ccgcccccac cggctgcatc aagaagcacg gctacaccgt ggaggtgcag 360
ttcgacggcg acatctgcaa caccatgcac tacaccaact ggacccacat ctacatctgc 420
gaggaggcca gcgtgaccgt ggtggagggc caggtggact actacggcct gtactacgtg 480
cacgagggca tccgcaccta cttcgtgcag ttcaaggacg acgccgagaa gtacagcaag 540
aacaaggtgt gggaggtgca cgccggcggc caggtgatcc tgtgccccac cagcgtgttc 600
agcagcaacg aggtgagcag ccccgagacc atccgccagc acctggccaa ccacagcgcc 660
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<210> 4
<211> 297
<212> DNA
<213> Artificial Sequence


<220>
<223> Mutant, Codon-Optimized HPV16 E7


<400> 4
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gacctgtacg gctacggcca gctgaacgac agcagcgagg aggaggacga gatcgacggc 120
cccgccggcc aggccgagcc cgaccgcgcc cactacaaca tcgtgacctt ctgctgcaag 180
tgcgacagca ccctgcgcct gtgcgtgcag agcacccacg tggacatccg caccctggag 240
gacctgctga tgggcaccct gggcatcgtg tgccccatct gcagccagaa gccctaa    297


<210> 5
<211> 297
<212> DNA
<213> Artificial Sequence


<220>
<223> Codon-Optimized HPV6a E7
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<400> 5
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gtgggcctgc actgctacga gcagctggtg gacagcagcg aggacgaggt ggacgaggtg 120
gacggccagg acagccagcc cctgaagcag cacttccaga tcgtgacctg ctgctgcggc 180
tgcgacagca acgtgcgcct ggtggtgcag tgcaccgaga ccgacatccg cgaggtgcag 240
cagctcctgc tgggtaccct gaacatcgtg tgccccatct cgcgctccaa gacctaa      297


<210> 6
<211> 318
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E7

<400> 6
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atgctgtgca tgtgctgcaa gtgcgaggcc cgcatcgagc tggtggtgga gagcagcgct    240
gacgacctgc gcgccttcca gcagctgttc ctgaacaccc tgagcttcgt gtgcccctgg    300
tgcgccagcc agcagtaa                                                 318


<210> 7
<211> 1107
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6a E2

<400> 7
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gagaacagca ccgacctgca caagcacgtg ctgcactgga gtgcatgcg ccacgagagc    120
gtgctgctgt acaaggccaa gcagatgggc ctgagccaca tcggcatgca ggtggtgcct    180
cctctgaagg tgagcgaggc caagggccac aacgccatcg agatgcagat gcacctcgag    240
agcctgctgc gcaccgagta cagcatggag ccctggacccc tgcaggagac cagctacgag    300
atgtggcaga cccctcccaa cgcgctgcttc aagaagcgcg gcaagaccgt ggaggtgaag    360
ttcgacggct gcgccaacaa caccatggac tacgtggtgt ggaccgacgt gtacgtgcag    420
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cgcggcgtgc agcagagccc ctgcaacgcc ctgtgcgtgg cccacatcgg ccccgtggat    780
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<210> 8
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<212> DNA
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<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2

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ctgcagcaca ctcccagccc ctacagcagc accgtgagcg tgggcaccgc caagacctac 720
ggccagacca gcgccgccac tcgccctggc cactgcggcc tggccgagaa gcagcactgc 780
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tgcctgcggt accgcctgcg caagcacagc gaccactacc gcgacatcag cagcacctgg 960
cactggaccg gcgccgggaa cgagaagacc ggcatcctga ccgtgaccta ccacagcgag 1020
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ggctacatga ccatgtaa                                              1098
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<210> 9
<211> 129
<212> DNA
<213> Artificial Sequence

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gtggtgagca ccgacgagta cgtggcccgc accaacatct actaccacgc cggcaccagc 120
cgcctgctg                                                        129
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<210> 10
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 10
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gacacccagc gcctggtgtg ggcctgcgtg ggcgtggagg tgggccgcgg ccagcccctg 120
ggcgtgggc                                                        129
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<210> 11
<211> 129
<212> DNA

<210> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 11
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atcggcgagc actggggcaa gggcagcccc tgcaccaacg tggccgtgaa ccccggcgac 120
tgccctccc 129

<210> 12
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 12
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atcaagatgg tgagcgagcc ctacggcgac agcctgttct ctacctgcg ccgcgagcag 120
atgttcgtgc gc 132

<210> 13
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 13
gccagcagca actacttccc cactcccagc ggcagcatgg tgaccagcga cgcccaaatc 60
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aaccagctg 129

<210> 14
<211> 135
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 14
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accctgaccg ccgacgtgat gacctacatc cacagcatga acagcaccat cctggaggac 120
tggaacttcg gcctg 135

<210> 15
<211> 135
<212> DNA
<213> Artificial Sequence

<220>

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<223> Codon-Optimized HPV16 L1 fragment

<400> 15
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aaggccaagc ccaag 135

<210> 16
<211> 135
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 16
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caggatcttg ttgttgttgg gcttcttgat ggggaagtag gggtggccca cggccagcag 120
gcggctggtg ccggc 135

<210> 17
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 17
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gggctggccg cg 132

<210> 18
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 18
cagggcacc tcgctcttgt tggcctgcag ggtggtgaag tccatggcgc cgaagccggt 60
gtccaccatg tcgccgtcct ggatcacggt gttgatcagc tccaggggag ggcagtcgcc 120
ggggttcac 129

<210> 19
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 19

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caggtcgtcg ggcacgttct cgcccacggc gccggcgcgg ttgaacaggt ggcgcacgaa 120
catctgctcg cg                                                   132
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<210> 20
<211> 144
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 20
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gctgatggcg gcgcacaggc tcatgttggt gctgcgggtg gtgtccacca cggtcacgaa 120
cagctggttg ccccagcaga tgcc                                      144
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<210> 21
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 21
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ccagtcctcc ag                                                   132
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<210> 22
<211> 123
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 22
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ggc                                                             123
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<210> 23
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 23
cgcggccagc ccctgggcgt g                                          21
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<210> 24
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<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 24
gcccacgccc aggggctggc cgcg                                              24

<210> 25
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 25
gccaacaaga gcgaggtgcc c                                                 21

<210> 26
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 26
caggggcacc tcgctcttgt tggc                                              24

<210> 27
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 27
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<210> 28
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 28
gggagtgggg aagtagttgc tgc                                               23

<210> 29
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<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 29
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<210> 30
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 30
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<210> 31
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 31
cactagagat ctgaattctt acagc   25

<210> 32
<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 L1 fragment

<400> 32
catctcagat ctgccaccat gagcctgtgg ctgcccag   38

<210> 33
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 33
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gtggaggccg tggtggagaa gaagaccggc gacgccatca gcgacgacga gaacgagaac   120
gacagcgac   129

<210> 34
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 34
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caggtagtcg ttgtcgttca cgatgaagtc caccaggtcc tcgccggtgt cgctgtcgtt 120
ctcgttctcg tc 132

<210> 35
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 35
gcccaggagg ccaagcagca ccgcgacgcc gtgcaggtgc tgaagcgcaa gtacctgggc 60
agcccctga gcgacatcag cggctgcgtc gacaacaaca tcagcccccg cctgaaggcc 120
atctgcatcg ag 132

<210> 36
<211> 131
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 36
ctcgtggcgg ccctccacct gcagcatctg ctgggtctcc acctcggtgt tgccgtagcc 60
gctgtcctcg ctctcgaaca ggcggcgctt ggcggcgcgg ctctgcttct cgatgcagat 120
ggccttcagg c 131

<210> 37
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 37
caggtggagg ccgccacga gaccgagacc ccctgcagcc agtacagcgg cggcagcggc 60
ggcggctgca gccagtacag cagcggcagc ggcggcgagg gcgtgagcga gcgccacacc 120
atctgccaga cc 132

<210> 38
<211> 135

<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 38
cttgaagggg cgcaccagct cgctgaagct cacgccgtac agctccttga acttggccag 60
catggcggcc ttggcgttgc tggtcttcag cacgttcagg atgttggtca gagggtctg 120
gcagatggtg tggcg 135

<210> 39
<211> 135
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 39
gagctggtgc gccccttcaa gagcaacaag agcacctgct gcgactggtg catcgccgcc 60
ttcggcctga cccccagcat cgccgacagc atcaagaccc tgctgcagca gtactgcctg 120
tacctgcaca tccag 135

<210> 40
<211> 136
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 40
catggggctc acgcacagca gcttgctcag cagcttctcg atggtctcgc ggttcttgcc 60
gcacttgtag cgcaccagca gcagcaccac catgccccag ctgcaggcca ggctctggat 120
gtgcaggtac aggcag 136

<210> 41
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 41
ctgctgtgcg tgagccccat gtgcatgatg atcgagcctc ccaagcttcg cagcaccgcc 60
gccgccctgt actggtacaa gaccggcatc agcaacatca gcgaggtgta cggcgacacc 120
cccgagtgga tc 132

<210> 42
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 42
ggcgatctcg ctgtcgtcca cgatgtcgtt gtcgtaggcc cactgcacca tctggctcag 60
ctcgaaggtg cagtcgttga agctgtgctg cagcacggtc tggcgctgga tccactcggg 120
ggtgtcgcc   129

<210> 43
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 43
gtggacgaca gcgagatcgc ctacaagtac gcccagctgg ccgacaccaa cagcaacgcc 60
agcgccttcc tgaagagcaa cagccaggcc aagatcgtga aggactgcgc caccatgtgc 120
cgccactac   129

<210> 44
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 44
gtagcgcagg aacatcacga tctgcttgcg gtcgccgccg tcgtccacgc ggtcgcagcg 60
gtacttgatc cactggctca tgctcatctg cttcttctcg gcgcgcttgt agtggcggca 120
catggtggc   129

<210> 45
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 45
cagatcgtga tgttcctgcg ctaccagggc gtggaattca tgagcttcct gaccgccctg 60
aagcgcttcc tgcagggcat ccccaagaag aactgcatcc tgctgtacgg cgccgccaac 120
accgacaag   129

<210> 46
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 46
gccgatcttg gcgtcggcca ggggctgcag ccagaagtgg ctcttgctgt tcacgaagca 60
gatcacgctg ccctgcagga acttcatcag gctcatgccg aacaggctct tgtcggtgtt 120
ggcggcgccg 130

<210> 47
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 47
ctggccgacg ccaagatcgg catgctggac gacgccaccg tgccctgctg gaactacatc 60
gacgacaacc tgcgcaacgc cctggacggc aacctggtga gcatggacgt gaagcaccgc 120
cccctggtg 129

<210> 48
<211> 132
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 48
gaactcgttg gggaaggtga acaccaccag gcggttgtgc aggtagggcc agcggctgtc 60
ggtgccggcg ttgatgttgc tggtgatcag caggggaggg cacttcagct gcaccagggg 120
gcggtgcttc ac 132

<210> 49
<211> 126
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 49
gtgttcacct tccccaacga gttccccttc gacgagaacg gtaaccccgt gtacgagctg 60
aacgacaaga ctggaagag cttcttcagc cgcacctgga ccgcctgag cctgcacgag 120
gacgag 126

<210> 50
<211> 105
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 50
catgagagat ctttacaggg tgttggtgtt ctggccgctc acgcacttga aggtgggcag 60
gctgtcgccg tcgttctcct tgtcctcgtc ctcgtgcagg ctcag 105

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<210> 51
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 51
gcctgaaggc catctgcatc gag                                        23

<210> 52
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 52
ctcgatgcag atggccttca ggc                                        23

<210> 53
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 53
gagctggtgc gccccttcaa g                                          21

<210> 54
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 54
cttgaagggg cgcaccagct c                                          21

<210> 55
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 55
ctgctgtgcg tgagccccat g                                          21
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<210> 56
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 56
catggggctc acgcacagca g   21

<210> 57
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 57
gccaccatgt gccgccacta c   21

<210> 58
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 58
gtagtggcgg cacatggtgg c   21

<210> 59
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 59
ctggccgacg ccaagatcgg c   21

<210> 60
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 60
gccgatcttg gcgtcggcca g   21

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<210> 61
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 61
gtgttcacct tccccaacga gttc                                24

<210> 62
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 62
gaactcgttg gggaaggtga acac                                24

<210> 63
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 63
catgagagat ctttacaggg tgttg                               25

<210> 64
<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E1 fragment

<400> 64
catctcagat ctgccaccat ggccgacccc gccggcac                 38

<210> 65
<211> 99
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 65
atggagaccc tgtgccagcg cctgaacgtg tgccaggaca agatcctgac ccactacgag 60
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aacgacagca ccgacctgcg cgaccacatc gactactgg                          99
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<210> 66
<211> 104
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 66
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gcagctgacc ctggagacga tctacaacag ccagtacagc aacg                  104
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<210> 67
<211> 108
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 67
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ccggctgcat caagaagcac ggctacaccg tggaggtgca gttcgacggc gacatctgca 60
acaccatgca ctacaccaac tggacccaca tttacatctg tgaggagg             108
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<210> 68
<211> 104
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 68
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cgtgcacgag gggatccgca cctacttcgt gcagttcaag gacgacgccg agaagtacag 60
caagaacaag gtgtgggagg tgcacgccgg aggccaggtg atcc                  104
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<210> 69
<211> 110
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 69
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ggccaaccac agcgccgcca cccacaccaa ggccgtggcc ctgggcaccg aggagaccca 60
gaccacaatc cagcgccctc gcagcgagcc cgacaccggc aacccctgcc           110
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<210> 70
<211> 107
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 70
gccacaaggg ccggatcaac tgcaacagca acaccacccc tatcgtgcac ctgaagggcg 60
acgccaacac cctgaagtgc ctgcggtacc gcttcaagaa gcactgc 107

<210> 71
<211> 113
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 71
ccagggtggg caccacctgg tggttgatgt gcttgaagcc catctcgcgg gccttgtagt 60
agatggcgca ggccaggcgc atgtgcttcc agtagtcgat gtggtcgcgc agg 113

<210> 72
<211> 101
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 72
gccgtgcttc ttgatgcagc cggtaggggc ggtcaggtac acctccaggc tcacgtcctg 60
cagggtccac ttctcgttgc tgtactggct gttgtagatc g 101

<210> 73
<211> 98
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 73
ggtgcggatc ccctcgtgca cgtagtacag gccgtagtag tccacctggc cctccaccac 60
ggtcacgctg gcctcctcac agatgtaaat gtgggtcc 98

<210> 74
<211> 110
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 74
gggtggcggc gctgtggttg gccaggtgct ggcggatcgt ctcggggctg ctcacctcgt 60
tgctgctgaa cacgctggtg gggcacagga tcacctggcc tccggcgtgc 110

<210> 75
<211> 111
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 75
gcagttgatc cggcccttgt ggctgctgtt gaaggcggtc aggatagggg cgctgtcgac 60
gctgtcgcgg tgcagcagct tggtggtgtg caggggttg ccggtgtcgg g   111

<210> 76
<211> 110
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 76
cgtaggtcag ggtcacgata gcgctcttgt gcttcacgtt gtggccggtc cagtgccagg 60
tgctgctcac ggcggtgtac agcttgcagt gcttcttgaa gcggtaccgc   110

<210> 77
<211> 111
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 77
tttagatgct catgaagccg gtgctcacgg tgatggtctt ggggatcttc acctggctca 60
ggaactggtc gcgctgccac tcgctgtcgt aggtcagggt cacgatagcg c   111

<210> 78
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 78
cgagctgata tcgaattcag atctgccacc atggagaccc tgtgccagcg   50

<210> 79
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 79
ggttgcagat ctagactcga gtttagatgc tcatgaagcc ggtgc   45

<210> 80
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 80
ccggctgcat caagaagcac g   21

<210> 81
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 81
ggccaaccac agcgccgcc   19

<210> 82
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 82
gccgtgcttc ttgatgcagc c   21

<210> 83
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

<400> 83
gggtggcggc gctgtgg   17

<210> 84
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E2 fragment

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<400> 84
cgtaggtcag ggtcacgata gc                                                22

<210> 85
<211> 109
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E7 fragment

<400> 85
ggccggagat ctgatatcga attcgccacc atgcacggcg acaccccac cctgcacgag 60
tacatgctgg acctgcagcc cgagaccacc gacctgtacg ctacggcc               109

<210> 86
<211> 106
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E7 fragment

<400> 86
gccgagcccg accgcgccca ctacaacatc gtgaccttct gctgcaagtg cgacagcacc 60
ctgcgcctgt gcgtgcagag cacccacgtc gacatccgca ccctgg                106

<210> 87
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E7 fragment

<400> 87
gggcgcggtc gggctcggcc tggccggcgg ggccgtcgat ctcgtcctct tcctcgctgc 60
tgtcgttcag ctggccgtag ccgtacaggt cggtgg                            96

<210> 88
<211> 106
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E7 fragment

<400> 88
ccgcggcaga tctagactcg agtttagggc ttctggctgc agattgggca cacgattccc 60
agggtgccca tcagcaggtc ctccagggtg cggatgtcga cgtggg                 106

<210> 89
<211> 25
<212> DNA
<213> Artificial Sequence
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<220>
<223> Codon-Optimized HPV16 E7 fragment

<400> 89
ggccggagat ctgatatcga attcg                                         25

<210> 90
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV16 E7 fragment

<400> 90
ccgcggcaga tctagactcg                                               20

<210> 91
<211> 105
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6a E7 fragment

<400> 91
gtcacagatc tgatatcgaa ttccaccatg cacggccgcc acgtgaccct gaaggacatc 60
gtgctggacc tgcagcctcc cgaccccgtg ggcctgcact gctac            105

<210> 92
<211> 105
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6a E7 fragment

<400> 92
ctggaagtgc tgcttcaggg gctggctgtc ctggccgtcc acctcgtcca cctcgtcctc 60
gctgctgtcc accagctgct cgtagcagtg caggcccacg gggtc            105

<210> 93
<211> 107
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6a E7 fragment

<400> 93
ccagcccctg aagcagcact tccagatcgt gacctgctgc tgcggctgcg acagcaacgt 60
gcgcctggtg gtgcagtgca ccgagaccga catccgcgag gtgcagc          107

<210> 94
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<211> 102
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6a E7 fragment

<400> 94
cagtcagatc tagagatatc tttaggtctt gggagcgcag atggggcaca cgatgttcag 60
ggtacccagc aggagctgct gcacctcgcg gatgtcggtc tc                     102

<210> 95
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> PCR Primer

<400> 95
gtcacagatc tgatatcgaa ttcc                                          24

<210> 96
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> PCR Primer

<400> 96
cagtcagatc tagagatatc tttagg                                        26

<210> 97
<211> 109
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E7 fragment

<400> 97
gtcacagatc tgatatcgaa ttccaccatg cacggcccca aggccaccct gcaggacatc 60
gtgctgcacc tggagcccca gaacgagatc cccgtggacc tgctgtgcc              109

<210> 98
<211> 111
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E7 fragment

<400> 98
gggctcggcc ctgcgagcgg gcaggtgctg gtggttcacg ccgtcgatct cgtcgttctc 60
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ctcctcgctg tcgctcagct gctcgtggca cagcaggtcc acggggatct c          111
```

<210> 99
<211> 108
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E7 fragment

<400> 99
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ggcccgcatc gagctggtgg tggagagcag cgctgacgac ctgcgcgc              108
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<210> 100
<211> 109
<212> DNA
<213> Artificial Sequence

<220>
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<400> 100
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ggtgttcagg aacagctgct ggaaggcgcg caggtcgtca gcgctgctc             109
```

<210> 101
<211> 26
<212> DNA
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<220>
<223> PCR Fragment

<400> 101
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gtcacagatc tgatatcgaa ttccac                                      26
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<210> 102
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> PCR Fragment

<400> 102
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cagtcagatc tagagatatc tttactg                                     27
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<210> 103
<211> 90
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 103
gaattcagat ctgatatcac catggaggcc atcgccaagc gcctggacgc ctgccaggag 60
cagctgctgg agctgtacga ggagaacagc 90

<210> 104
<211> 92
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 104
ccttgtacag cagcacgctc tcgtggcgca tgcacttcca gtgcagcacg tgcttgtgca 60
ggtcggtgct gttctcctcg tacagctcca gc 92

<210> 105
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

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<210> 106
<211> 103
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 106
gcagggtcca gggctccatg ctgtactcgg tgcgcagcag gctctcgagg tgcatctgca 60
tctcgatggc gttgtggccc ttggcctcgc tcaccttcag agg 103

<210> 107
<211> 98
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 107
cgagtacagc atggagccct ggaccctgca ggagaccagc tacgagatgt ggcagacccc 60
tcccaagcgc tgcttcaaga agcgcggcaa gaccgtgg 98

<210> 108
<211> 102

<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 108
cgttgtcctg cacgtacacg tcggtccaca ccacgtagtc catggtgttg ttggcgcagc 60
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<210> 109
<211> 102
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 109
ccgacgtgta cgtgcaggac aacgacacct gggtgaaggt gcacagcatg gtggacgcca 60
agggcatcta ctacacctgt ggccagttca agacctacta cg 102

<210> 110
<211> 92
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 110
gctgccgtag cacacctccc agtgcttggt gctgccgtac ttctcggcct ccttcacgaa 60
gttcacgtag taggtcttga actggccaca gg 92

<210> 111
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 111
gcactgggag gtgtgctacg gcagcaccgt gatctgcagc cccgctagcg tgagcagcac 60
cacccaggag gtgagcatcc ccgagagcac cacc 94

<210> 112
<211> 97
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 112

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gcgaggaggg gtctgcacgg cgtcctcctt ggtgctgctg ctcaccaggg tgctggtctg    60
ggcgggagtg taggtggtgc tctcggggat gctcacc                             97

<210> 113
<211> 97
<212> DNA
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<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 113
ggacgccgtg cagacccctc ctcgcaagcg cgcccgcggc gtgcagcaga gcccctgcaa 60
cgccctgtgc gtggcccaca tcggccccgt ggacagc                          97

<210> 114
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 114
ggcgctgctg ttgctgttgt tgcggcgctg gtgctggtcg tggttgttgg tgatcaggtt 60
gtggttgccg ctgtccacgg ggccgatgtg ggcc                             94

<210> 115
<211> 95
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 115
ccgcaacaac agcaacagca gcgccactcc catcgtgcag ttccagggcg agagcaactg 60
cctgaagtgc ttccgctacc gcctgaacga tcgcc                            95

<210> 116
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 116
cgtgcttgtg gggagccttg ctgctggccc agtgccaggt gctgctgatc aggtcgaaca 60
ggtggcggtg gcgatcgttc aggcggtagc ggaagc                           96

<210> 117
<211> 95
<212> DNA
<213> Artificial Sequence
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<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 117
gcagcaaggc tccccacaag cacgccatcg tgaccgtgac ctacgacagc gaggagcagc 60
gccagcagtt cctggacgtg gtgaagatcc ctccc 95

<210> 118
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 118
ctcgagagat ctcccgggtc tagagcttac agcaggtgca ggctcatgaa gcccagcttg 60
tggctgatgg tgggagggat cttcaccacg tccagg 96

<210> 119
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 119
gaattcagat ctgatatcac catgg 25

<210> 120
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 120
gcagggtcca gggctccatg c 21

<210> 121
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
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<400> 121
cgagtacagc atggagccct ggacc 25

<210> 122
<211> 25

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<212> DNA
<213> Artificial Sequence

<220>
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<400> 122
gctgccgtag cacacctccc agtgc                                          25

<210> 123
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 123
gcactgggag gtgtgctacg g                                              21

<210> 124
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 124
ggcgctgctg ttgctgttgt tgc                                            23

<210> 125
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 125
ccgcaacaac agcaacagca gc                                             22

<210> 126
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV6 E2 fragment

<400> 126
ctcgagagat ctcccgggtc tagagc                                         26

<210> 127
<211> 97
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<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 127
gaattcagat ctgatatcac catgcagact cccaaggaga ccctgagcga gcgcctgagc 60
gccctgcagg acaagatcat cgaccactac gagaacg 97

<210> 128
<211> 98
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 128
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ccttgctgtc gttctcgtag tggtcgatga tcttgtcc 98

<210> 129
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 129
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ccaggtggtg cccgcctaca acatcagcaa gagc 94

<210> 130
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 130
cctcggtctt gtaggcgctc tgggccaggc cctgcagggc catctgcagc tcgatggcct 60
tgtgggcctt gctcttgctg atgttgtagg cggg 94

<210> 131
<211> 91
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 131

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acaccgagcc cacccactgc ttcaagaagg g                               91
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<210> 132
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 132
gctgtcccag gccacgtagt tcatgcagtt gtccttgttg ccgtcgaagt acacctgcac 60
ggtctggcct cccttcttga agcagtgggt gggc                            94
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<210> 133
<211> 90
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 133
gcatgaacta cgtggcctgg gacagcgtgt actacatgac cgacgccggc acctgggaca 60
agaccgccac ctgcgtgagc caccgcggcc                                 90
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<210> 134
<211> 92
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 134
ccgtacttct cgcactcgct cttgaactcg atgtagaagg tgttgtagcc ctccttcacg 60
tagtacaggc cgcggtggct cacgcaggtg gc                              92
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```
<210> 135
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 135
cgagttcaag agcgagtgcg agaagtacgg caacaccggc acctgggagg tgcacttcgg 60
caacaacgtg atcgactgca acgacagcat gtgc                            94
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<210> 136
<211> 100
<212> DNA
<213> Artificial Sequence
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<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 136
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<210> 137
<211> 93
<212> DNA
<213> Artificial Sequence

<220>
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<400> 137
gcacactccc agcccctaca gcagcaccgt gagcgtgggc accgccaaga cctacggcca 60
gaccagcgcc gccactcgcc ctggccactg cgg   93

<210> 138
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 138
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gcttctcggc caggccgcag tggccagggc gagtgg   96

<210> 139
<211> 97
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 139
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atccacctga agggcgaccg caacagcctg aagtgcc   97

<210> 140
<211> 97
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 140
ggcgccggtc cagtgccagg tgctgctgat gtcgcggtag tggtcgctgt gcttgcgcag 60
gcggtaccgc aggcacttca ggctgttgcg gtcgccc   97

<210> 141
<211> 99
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 141
gcacctggca ctggaccggc gccgggaacg agaagaccgg catcctgacc gtgacctacc 60
acagcgagac ccagcgcacc aagttcctga acaccgtgg 99

<210> 142
<211> 98
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 142
ctcgagagat ctcccgggtc tagagcttac atggtcatgt agcccaccag gatctgcacg 60
ctgtcgggga tggccacggt gttcaggaac ttggtgcg 98

<210> 143
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 143
gaattcagat ctgatatcac catgc 25

<210> 144
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 144
cctcggtctt gtaggcgctc tgg 23

<210> 145
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 145
cccagagcgc ctacaagacc g   21

<210> 146
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 146
ccgtacttct cgcactcgct c   21

<210> 147
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 147
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<210> 148
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 148
gcttgttgtt gccggtggcg g   21

<210> 149
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 149
gccaccgcca ccggcaacaa caagc   25

<210> 150
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon-Optimized HPV18 E2 fragment

<400> 150
ctcgagagat ctcccgggtc tagagc   26